the hexoses show increase. The curves for hexose, starch, and this dextro-rotatory material are intimately related and indicate interconvertibility; the last-named substance may be a protein or a gum standing in causal relation to starch synthesis.

In the leaves the daily fluctuations of alcohol-soluble substances is through a range almost twice as great as that of total sugars. In the stalks the same is true, in which respect the potato is unlike the mangold. The dextrose-levulose ratio determinations are of little significance because of the presence of laevo-rotatory non-sugars, probably asparagine, but the authors regard them as being present in equal amounts as splitting products of saccharose. The polarization readings for saccharose were aberrant as in the mangold, by reason of the presence of impurities of the same character. Levulose apparently predominates in the leaves and dextrose in the stalks, by reason of the accumulation of dextro-rotatory stuffs in the latter, or possibly by reason of an actual excess due to the using up of levulose in tissue building. That this latter alternative is the correct one is indicated by the fact that the determinations of cane sugar by polarization and by reduction are in close agreement.—JOSEPH S. CALDWELL.

The Oenothera situation.—Three recent papers have cast some light on the perplexing *Oenothera* situation. One of the most serious objections to the mutation theory has been that mutants which have appeared under observation in artificial cultures have regularly been interfertile, while incipient species in nature are essentially intersterile. METZ and BRIDGES[4] have shown that mutants may be intersterile, describing two cases in *Drosophila*, each involving two mutants that either refuse to cross or else give sterile hybrids.

MULLER[5] has explained a curious case in *Drosophila*, which strikingly resembles the *Oenothera* situation. A certain race of *Drosophila* breeds practically true, and yet it is in a heterozygous condition. This paradox is explained by "balanced lethal factors," a given chromosome and its allelomorph each carrying lethal factors. When one of these factors is present in a zygote it brings death, but when both factors are present they are antagonistic in their action and the zygote develops into a mature individual. Thus the homozygotes, which are thrown off every generation, die in infancy, since they contain single lethal factors; only the heterozygotes survive, for in them alone are the lethal factors balanced and inactive. The result is that the heterozygous race seems to breed true. This balanced race, as we should expect, gives in crosses twin hybrids as in *Oenothera* crosses, while crossing two such balanced races in *Drosophila* gives multiple hybrids, as also occurs in *Oenothera*.

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[4] METZ, C. W., and BRIDGES, C. B., Incompatibility of mutant races in *Drosophila*. Proc. Nat. Acad. Sci. 3:673–678. 1917.

[5] MULLER, HERMANN J., An *Oenothera*-like case in *Drosophila*. Proc. Nat. Acad. Sci. 3:619–626. 1917.

Another similarity with the *Oenothera* situation is that in this *Drosophila* race there would occasionally appear recessive mutants on one of these two "lethal chromosomes." These recessive mutants, however, could not become manifest on account of the enforced heterozygosity. They could only become manifest when crossing over occurred and homozygosity was thus made possible. "As crossing over occurs with predictable frequencies, those individuals showing characters abnormal to the stock were thrown continually in a definite, very small percentage of cases." In just such a regular, although small, percentage of cases does *Oenothera Lamarckiana* throw its mutants. MULLER concludes that the *Oenothera* situation is to be explained by a similar mechanism, "but probably the lethal effect in *Oenothera* is on the gametes rather than on the zygote."

A similar idea appears in a paper by DAVIS,[6] in which we find summarized some of the evidence, old and new, on the suspected hybrid condition of *Oenothera Lamarckiana*. The regularity with which the same old mutants are thrown and the production of twin hybrids in crosses suggest to this author the hybrid condition of *O. Lamarckiana*. The facts that about one-half of both pollen and ovules, in random distribution, are sterile, and that only 30–40 per cent of the seeds produced are fertile, suggest that only such gametes and zygotes are fertile as will reproduce the hybrid type. The argument is essentially similar to that of MULLER. "If it could be shown that in every group of 4 pollen grains (tetrad) formed as the result of the reduction mitoses only 2 grains are perfect, the conclusion would be justified that pollen sterility was the result of this segregation division." The author regards this as impossible, however, since abortion takes place after the tetrads have lost their identity. On this point we may quote from a review which appeared in this journal[7] on some work of GEERTS. "In *Oenothera Lamarckiana* 50 per cent of the ovules are found to degenerate and about 50 per cent of the pollen grains, *two from each tetrad of spores*."

It begins to look more and more probable that our classic illustration of mutation is really about the most unfavorable material that could have been chosen for the subject, owing to its germinal complexities. This complexity and seeming lack of conformity have served to make "*Oenothera* genetics" a science in itself. Geneticists will feel relieved when these data on *Oenothera* are finally interpreted by the Mendelian system, and there is now much hope that this may soon come to pass.—MERLE C. COULTER.

Edible and poisonous mushrooms.—Popular interest in the fleshy fungi appears to be growing in many sections of the country. This interest may be attributed to several different causes, chief of which are to be found in the

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[6] DAVIS, B. M., A criticism of the evidence for the mutation theory of DE VRIES from the behavior of species of *Oenothera* in crosses and in selfed lines. Proc. Nat. Acad. Sci. 3:704–710. 1917.

[7] BOT. GAZ. 47:481. 1909.